Pacific Conservation Biology

Publication models in a changing environment: bibliometric analysis of books and book chapters using publications by Surrey Beatty & Sons

MICHAEL C. CALVER

JOSEPH B. FONTAINE

THEA E. LINKE

School of Veterinary and Life Sciences, Murdoch University, Murdoch, Western Australia 6150, Australia

Correspondence to M C Calver - Telephone: +61 9 360 2277, Fax +61 9 360 6303

Email – m.calver@murdoch.edu.au

Running title: Implications of database errors

Key words: bibliometrics, citation study, book chapters, WorldCat, Google Books, Google Scholar, Scopus, Web of Science, Web of Knowledge.

Expectations and patterns of publication have changed markedly with evolving online availability and associated development of new citation gathering databases. Perhaps the most vulnerable components of the scientific literature to ongoing change are books and book chapters, given their elongated publication timelines and generally more limited online availability. To test this, we applied citation analyses and assessments of library holdings to determine the use of the natural history books published by Surrey Beatty & Sons between 1987 and 2010. We (i) evaluated the relative use of book chapters and journal papers by comparing citations to chapters in the five books of the *Nature Conservation* series by Surrey Beatty & Sons to citations of journal chapters in four Australian journals published in the same years, (ii) determined the efficacy of four different databases in retrieving citations to book chapters by comparing their recovery of citations to the five books of the *Nature Conservation* series, and (iii) quantified non-citation measures related to library holdings to evaluate the use of the books on the entire Surrey Beatty & Sons list.

Mean citations/chapter to the first three books in the *Nature Conservation* series were similar to the mean citations/paper in four Australian journals published in the same years. However, the mean citations/chapter of the last two books declined relative to citations/paper for the journals, suggesting a fall in book use evident by early this century. Citation retrieval varied across databases; Google Scholar retrieved most citations, followed by Scopus, Web of Science (Cited Reference Search) and Web of Knowledge. Contrary to published concerns, no citations retrieved by Google Scholar were in questionable sources such as contents pages - many were from highly ranked journals.

Each book in the full Surrey Beatty & Sons list was held by an average of 45.3 libraries in Australia and 36.1 in the USA, and less than five in each of the UK, New

Zealand, Hong Kong, Canada, Germany and South Africa. This was a similar coverage to another Australian publisher, the Royal Zoological Society of New South Wales, and indicated strong markets in Australia and the USA. It was less, though, than the number of libraries with current or past subscriptions to five Australian journals publishing nature conservation content.

We conclude that citation data for books and book chapters are available and that library holdings provide another measure of use. The online 'visibility' of books may be a problem, but can be improved through better marketing and improved author search techniques.

INTRODUCTION

The 21st century has seen a marked rise in bibliometrics – methods to analyse the quality and impact of scientific or technical literature quantitatively (OECD 2010). Many, but not all, of these methods are based on citations (Adler *et al*. 2008). The goal is generally to encourage quality and productivity in research outputs, and to ensure that scarce research funds are used effectively (Butler and McAllister 2009; Box 2010; Oswald 2010). The approach is now entrenched in research management in many countries (Visser 2009; Gihus and Sivertsen 2009; Broadbent 2010; Corsi *et al*. 2010; Cooper and Poletti 2011).

One area not served well by the rise of bibliometrics is the assessment of books and book chapters. Major databases of scientific literature only recently began to list books and book chapters amongst their outputs (e.g., Web of Science (WoS) has only included book citation details since 2011, covering the previous five years – Testa 2012), or have decided not to list them at all because of the frequency of errors that authors make when citing them (e.g., Scopus - Elsevier 2011). Nevertheless, citations to books and book chapters by sources listed in Scopus and WoS can be retrieved with specialist searches ('secondary documents' function and 'cited reference search' respectively). They can be tedious (Bar-Ilan 2010; Kousha *et al*. 2011) and still miss citations from books or book chapters to other books or chapters.

Google Scholar (GS) (http://scholar.google.com.au/intl/en/scholar/about.html) is a non-commercial option, retrieving citations from web-based sources including books, book chapters, conference proceedings, grey literature (reports, theses, websites, and other ephemeral or generally unavailable sources difficult to access through conventional library or publisher sources – see Debachere 1995; Calver and

King 2000), reports and theses, enabling citation profiles for books or book chapters (although some raise concerns about inflated citation counts - Jacsó 2008a,b; Bar-Ilan 2010). Inconsistencies across search engines have led to recommendations to consult multiple databases when conducting evaluations, even for the journal literature, to ensure that as many relevant citations as possible are retrieved (Jacsó 2008a).

Torres-Salinas and Moed (2009) and White *et al*. (2009) take a very different approach, proposing library uptake of books as an indication of use. The logic is that librarians choose books carefully to meet the needs of patrons while containing costs, analogous to authors citing papers. Where patrons themselves recommend books, even greater subject expertise is involved. Online global library catalogues such as WorldCat (http://www.worldcat.org) can therefore be used as a publicly available indicator of the uptake of books. White *et al*. (2009) coined the term 'libcitation' for assessments of library holdings of books globally or nationally. They also point out that books can be classified into Library of Congress class (LC classes), so books within an LC class can be ranked using their relative libcitations.

Given the importance of demonstrating the uptake of research for evaluation purposes and the limitations of some of the established citation-based procedures for collecting data on books and book chapters, there is a need to demonstrate methods to document use of books and book chapters. Such methods ensure accurate evaluations of publication records and contributions by different types of literature (Harzing and van der Wal 2008; Kousha and Thelwall 2009; Kousha *et al*. 2011). Previous work on this topic is limited mainly to the humanities and social sciences, so we consider nature conservation by assessing natural history books published by Surrey Beatty & Sons between 1987 and 2010.

We first quantified relative citation rates for book chapters and journal papers by profiling citations to chapters in the five books in the Surrey Beatty & Sons *Nature Conservation* series (1987 – 2000), relative to four Australian peer-reviewed journals in the same subject area using four widely used databases. Next, we compared citation profiles among the four databases to estimate their relative utility for retrieving citation data. We also sought to address criticisms of the quality of the citations retrieved by GS (Jacsó 2008a,b) by examining a subset of the citations to determine the sources, which we benchmarked against the classifications of a journal-ranking website. Lastly, we used WorldCat to document the libraries in eight countries holding copies of books on the Surrey Beatty & Sons list and benchmarked the results against similar data for books published by the Royal Zoological Society of New South Wales (RZSNSW), which also publishes books relevant to nature conservation in Australasia, over the same period. We also compared the Surrey Beatty & Sons books against five Australian journals publishing ecological/conservation studies, giving comparative data on the library holdings of books and journals. We intended these data as 'proof of concept' for the use of library holdings to assess the use of books. The data are relevant to researchers seeking broader information than might normally be accessed through conventional databases, and to publishers wishing to increase their books' profiles in an electronic market.

METHODS

For citation analysis we selected the five volumes of Surrey Beatty & Sons' *Nature Conservation* series (Saunders *et al.* 1987; Saunders and Hobbs 1991; Saunders *et al*. 1993; Saunders *et al*. 1996; Craig *et al*. 2000). (The first book in the

series was never actually designated with a series name, but we have used it as a notation of convenience). This series gives a unified focus to five books published over 14 years, allowing assessments of changes in citation trends over time as well as comparisons of citation retrieval across the databases GS, Web of Knowledge (WoK), Web of Science (Cited Reference Search) (WoSCRS) and Scopus. The series ended in 2000, so there has been ample time for citations to accumulate.

To assess library holdings, we evaluated all 90 Surrey Beatty & Sons books related to natural history or conservation published between 1987, when the firm began to publish books in its own right as opposed to joint titles with other organizations, and stopping in 2010 to allow time for acquisition of the most recent books. We included single author books and edited volumes.

Evaluation of citations

The databases

WoK is a subscription service allowing simultaneous searches of up to 18 databases using the 'search all databases' tab on the search page (Testa 2006). The component databases vary in the years covered and institutional subscriptions may also vary in the extent of back coverage and in the component databases included. The Murdoch University subscription to WoK available to us did not include updates to one component database, Zoological Record, since 2000. However, it included BIOSIS Citation Index and BIOSIS Previews, which cover books as well as journal and conference papers from 1926 and 1969 respectively.

WoSCRS is a specialist search option within the well-known Web of Science (WoS) database, a subsidiary of WoK. We chose WoSCRS in preference to the standard WoS because WoS only began listing books in 2012 with coverage for the

previous five years (Thomson Reuters 2011), well after the publication of the last book in the *Nature Conservation* series (Craig *et al*. 2000). However, WoSCRS includes citations from sources listed in WoS to any source, irrespective of whether or not the cited source is also in WoS (Jacsó 2008a). Thus it does retrieve citations to books prior to 2005. It is a less well-known option; thus we present a series of screen shots illustrating the procedure for a cited reference search (Appendix 1).

While books are not listed in the main Scopus database, Scopus does claim to list book series (Elsevier 2011). Furthermore, citations from entries in Scopus to unlisted items can be retrieved using the ‘secondary documents’ option, which replaced the 'More' option described by Bar-Ilan (2010) (see Appendix 2 for an example). Although Scopus does not claim to have complete citation data earlier than 1996 (Elsevier 2011), we still used it to evaluate all books in the series to compare these 'incomplete' records against those in other databases.

Unlike WoK, WoSCRS and Scopus, GS retrieves citation information with intensive, indexed internet searches, rather than from records in its own proprietary database (Smith and Nelson 2008; http://support.google.com/webmasters/bin/answer.py?hl=en&answer=182072). Access is free as opposed to the substantial subscription fees of proprietary databases and GS searches an extremely wide range of literature and citations, making it valuable for searching academic literature in all formats (Harzing and van der Wal 2008; Bar-Ilan 2010; Kousha *et al*. 2011; Walters 2011). However, its underlying documentation is poor, especially with regard to what can be included. Citation counts may be inflated because of 'sources' such as contents pages or abstracting services and double counting of the same citation, although there is steady improvement (Jacsó 2008a,b).

Database searches

In November and December 2012, we searched for individual chapters in each book in the *Nature Conservation* series in WoK, WoSCRS and GS. These books are actually conference proceedings, so we suspected that they might have been cited by the year of the conference rather than the year of publication and we therefore searched for both the year of the conference and the year of publication. We also found that not all authors were listed in multi-authored chapters, so we searched for subsets of authors to broaden citations retrieved. When using WoK or GS, we assigned 0 citations to any chapter not retrieved, but noted any unretrieved chapters as an indication of completeness of coverage. This distinction did not apply to WoSCRS, because only cited chapters are retrieved. Therefore, we concluded that unretrieved chapters had no citations. The secondary documents feature in Scopus allowed for searching by the book title (specified as the source title), which retrieved citations to all chapters from a single search. Only cited chapters are retrieved, so any not retrieved were assumed to have no citations. In all cases, citation data were counted from the year of publication to the search date.

Quality of citations in Google Scholar

GS is criticised for including spurious citations such as contents pages, citations from online blogs, theses and unreviewed reports, as well as for double counting of the same citations (Jacsó 2008a,b). To determine if such issues occurred in our data, we selected randomly a single chapter with 10 or more citations in GS from each of the five *Nature Conservation* books. We then identified the source of all these citations. Where the source was a journal, we also determined the rating of that source

in the SCImago (2007) database in January 2013. This places journals in one of four quartiles, based on the SJR journal ranking statistic (Gonzalez-Pereira *et al*. 2010): 1 the top 25%, 2 the next 25%, and so on. Journals may be classified in more than one subject area, so where this occurred we presented the median rating for that journal. If a journal was not listed in SCImago, we allocated it a rating of 4*, on the assumption that it was unlikely to be listed higher if included. Thus we were able to estimate the incidence of the problems identified by (Jacsó 2008a,b) and also document the relative standing, based on SJR, of the journal citations retrieved.

Citations to book chapters relative to citations to journal papers

We compared the citations retrieved by GS for chapters from each of the five *Nature Conservation* books to those retrieved from papers published in the same year as each of the books in the journals *Australian Zoologist*, *Austral Ecology* (or its predecessor *Australian Journal of Ecology*), *Australian Journal of Zoology* and *Wildlife Research*. We chose GS *a priori* for its claimed superiority in retrieving citations to books and book chapters (Bar-Ilan 2010; Kousha *et al*. 2011). The citations for the journals were retrieved in January 2013. Although this was slightly later than the retrieval dates for the book data (November/December 2012), we felt that major differences were unlikely to arise over a few weeks, particularly for publication dates >10 years old.

Evaluation of library holdings

International libraries holding copies of Surrey Beatty & Sons books were identified using WorldCat, an initiative of the Online Computer Library Centre, which maintains the database. It lists the holdings of over 70,000 libraries from 170 different

countries, making it possible to identify rapidly the number of libraries in particular countries holding a copy of a book (Chen 2012; Metz 2011; OCLC 2012).

In November and December 2012, we used the advanced search option in WorldCat to locate the number of libraries in Australia, USA, UK, New Zealand, Canada, Germany, Hong Kong and South Africa holding Surrey Beatty & Sons books. We selected these countries to reflect the main market of the books in Australasia, as well as checking for international uptake in North America, Europe (including both English-speaking and non-English-speaking countries), Asia and Africa. Searching for individual books by author and title was easy, except for the 10 volumes of the *Amphibian Biology* series and the two volumes of *Australian Rainforests*. In these cases it was often unclear whether an entry for a particular library reflected only a single volume in the series or a holding of the entire series. In these cases we combined the results across all volumes in the series, giving 80 books for evaluation.

We did not attempt to rank Surrey Beatty & Sons titles within an LC Class for Australian books (White *et al*. 2009), because this requires a subscription access to the Australian National Bibliographic Database and we wished to demonstrate 'proof of concept' with publicly available data. As a benchmark against which to assess uptake of Surrey Beatty & Sons Books, we determined the number of libraries in the same eight countries holding copies of the books published by RZSNSW between 1987 and 2010 (aggregating records for the two editions of *Conservation of Australia's Forest Fauna*, which could not be separated reliably in WorldCat entries). RZSNSW books also emphasize nature conservation, so they are a reasonable benchmark. We also benchmarked book uptake against library subscriptions (current and discontinued) from these countries to the four Australian journals listed above,

plus *Pacific Conservation Biology* (*Pacific Conservation Biology* began publication in 1993, so was unsuitable for use in the citation analysis but appropriate here). It was not possible in WorldCat to determine whether subscriptions were current, because journals are listed by the year of first publication or the date of foundation of the society that publishes them. It was also unclear whether or not some supposed holdings of *Australian Zoologist* are in fact holdings of any publication of the Royal Zoological Society of New South Wales. These data were collected in November/December 2012.

Data analysis

Citation frequencies for the five books in the *Nature Conservation* series retrieved from WoK, WoSCRS, GS and Scopus were explored further using repeated measures analysis of variance. We discovered that the first book in the *Nature Conservation* series, Saunders (1987), was not listed in WoK, which created an incomplete design. Results from four databases were available for the last four books in the series, but only results from three databases were available for the first. Therefore we ran two repeated measures ANOVAs. The first had a factor of Book for the five books, a repeated measures factor of Database for three databases (WoK excluded) and the number of citations to book chapters in each database as the dependent variable. The second analysis was similar, but included all four databases and covered only the last four books in the series. Citation data are highly skewed (Calver and Bradley 2009), so data were log transformed before analysis. Given that there were more than two levels of the repeated measures factor Database in both analyses, we also incorporated the Greenhouse-Geisser correction when assessing the significance of Database and its interaction with Book (von Ende 2001). This adjusts

the degrees of freedom downward in the F-statistic to correct for violations of homogeneity of variance; values obtained in our analyses suggested very minor deviations in the variance structure of log-transformed data.

A comparison of mean citations for book chapters against those for journal papers published in the same year was assessed using two-way analysis of variance. The factors were Source (for the books and the journals) and Year (the year of publication) and the dependent variable was the log of the number of citations for each book chapter or journal paper. Repeated measures did not apply in this case, because although the same journals were sampled in different years the papers published in each year were independent, as were the papers in the different journals and book chapters in a given year.

We used tabulations and descriptive statistics to document library holdings of Surrey Beatty & Sons books, RZSNSW books and journal subscriptions.

RESULTS

Evaluation of citations

When WoK, GS, WoSCRS and Scopus were used to document citations from books two to five in the *Nature Conservation* series, GS consistently retrieved more citations than Scopus, which in turn retrieved more citations than WoSCRS, which retrieved more citations than Wok. These differences were most marked in book three in the series (Saunders *et al.* 1993). All four databases showed a decline in citations in more recent books, although the pattern of this varied. GS recorded similar mean citations for books two and three, but citations declined in books four and five. Scopus and WoSCRS showed a similar pattern. Citations retrieved by WoK fell

markedly from book two to book three and stayed low for the last two books (Figure 1). Statistically, these results were evidenced by a significant interaction between databases and books ($F_{9, 675} = 11.4$, $p < 0.001$) (still significant at $p < 0.001$ after adjusting the degrees of freedom with the appropriate Greenhouse-Geisser epsilon, 0.80).

When all five books were compared using GS, WoSCRS and Scopus, GS consistently retrieved more citations than Scopus, which in turn retrieved more citations than WoSCRS for all books except book one. All databases indicated similar citations for the first three books in the series, followed by a decline in citations for the last two books (Figure 2). Statistically, these results were evidenced by a significant interaction between databases and books ($F_{8, 550} = 4.7$, $p < 0.001$) (still significant at $p < 0.001$ after adjusting the degrees of freedom with the appropriate Greenhouse-Geisser epsilon, 0.90).

Quality of GS citations

We found no evidence of dubious citations in GS such as citations by blogs or contents pages (Table 3). Many citations were from highly ranked journals, with 49 of the 118 citations being from journals ranked in Quartile 1 or 1.5 by SCImago. GS also returned many citations from less conventional sources such as book chapters, reports and theses, the proportion ranging from 0.18 for Saunders *et al*. (1996) to 0.59 for Saunders (1987).

Citations to book chapters relative to citations to journal papers

The citations to each of the four journals remained similar over the period of the study, while the citations to the books remained similar for 1987 to 1993, before

declining (Figure 3). Statistically, this was evidenced by a significant interaction between the number of citations retrieved by Google Scholar for the five Surrey Beatty & Sons books and the four journals over time ($F_{16, 1077} = 8.0$, $p < 0.001$).

WorldCat Listings

Each Surrey Beatty & Sons book was held by an average of 45.3 libraries in Australia and 36.1 in the USA, and less than five in all other countries (Table 1). Distributions of holdings of these books in most countries were approximately normal, as indicated by the similarity of the mean and median for all countries except the USA. In the USA, the mean was more than double the median, suggesting a distribution with a long right tail. This was confirmed by the range, with one book held by 1 077 libraries in the US. These results were mirrored in the data for the RZSNSW books over the same period, which were held in a mean of 44.4 libraries in Australia and 20.6 in the USA, and three or less in the other countries. The median holdings were all similar to the mean, indicating normal distributions of holdings (Table 2).

Unlike book holdings, library subscriptions to the five journals were highest in the USA followed by Australia. Journal subscriptions in other countries were markedly lower. In most countries for most journals, journal subscriptions exceeded the mean number of libraries holding books by either publisher (Table 3). It was not clear from the WorldCat entries, though, whether or not all these journal subscriptions were current. Therefore journal subscription information may be inflated.

DISCUSSION

Citations of books in the *Nature Conservation* series

Irrespective of the merits of the different databases, they all agree that the mean citations/chapter for the last two books in the *Nature Conservation* series declined markedly relative to the earlier ones. This is unlikely to be because of lower interest in the subject content of these books, because they both attracted large numbers of contributions (80 and 71 respectively). While the earlier books have had longer to accrue citations and this may be a factor, the citations to book chapters relative to journal articles supports the suggestion that authors' searching and citing behaviours are changing. Between 1987 and 1993 the citations to books from the *Nature Conservation* series were within the range of citations to four Australian journals publishing similar content. However, the last two books in the series, published in 1996 and 2000, showed marked declines in citations while the journals continued at similar or slightly increased citation levels.

In their study of the influence of open access (material available for free download via the internet) on citations for journal papers and book chapters in the general field of conservation biology, Calver and Bradley (2010) found statistically significant increases in citation rates for open access book chapters but little evidence for increased citations for open access journal papers. This suggests that access to the journal literature is already strong through conventional sources such as the major databases and publisher websites, but that book chapters are less visible. This could explain the decline observed in the citations to the later books if authors have shifted their search patterns to online sources that, in the main, give poorer coverage to books.

Access to books and book chapters is not helped by problems of including them in databases of research literature, including: diversity of languages, with an English

version sometimes unavailable; diversity of publishers; restricted availability of some books; and the frequency of errors in citing books and book chapters that lead to questionable citation counts (Elsevier 2011). Furthermore, books and book chapters are a modest part of the science literature. Across all the science disciplines listed by Elsevier (2011), books and book chapters represent less than 1% and 10% respectively of total outputs in each discipline. Therefore there is a reluctance to include books and book chapters in databases (e.g., Scopus, Elsevier 2011) or the selection policy is restrictive (e.g., Web of Science, Testa 2012). While selection policies are supposedly designed to include only the most important books (Testa 2012), they can leave significant gaps such as those acknowledged regarding selective journal listings (Stergiou and Tsikliras 2006). The WoSCRS and the Scopus 'secondary documents' option are partial solutions, retrieving citations to unlisted books and book chapters from listed sources (Jacsó 2008a; Bar-Ilan 2010; Kousha *et al*. 2011) but still overlooking citations from books to books or from chapters to chapters. GS is the least restrictive search option of all (Harzing and van der Wal 2008), despite criticisms of 'citation inflation' in its results (Jacsó 2008a,b).

Citations to the five books in the *Nature Conservation* series support the utility of GS for retrieving citations to books. GS consistently returned more citations for any book in the series compared to the other databases. We found no evidence of citation inflation from highly questionable sources such as contents pages, repeated entries or blogs, although some might consider the citations from theses, other books or reports as of lesser value than citations from journals. We disagree, sharing the view of Harzing and van der Wal (2008) that theses, books and reports are all valid sources of citations because they reflect use of materials in scholarship. Furthermore, up to 40% of the Google Scholar citations included entries from journals ranked in the

top quartile in their field by SCImago, confirming that prestigious citations are also retrieved. Kousha *et al*. (2010), in a study of two information technology journals, found up to 73% of citations from online sources such as GS that were not available in WoS or Scopus. In the specific case of books, Kousha and Thelwall (2009) found that, in the social sciences, book citations to specific research articles were from 31% to 212% of journal citations to those same articles retrieved from WoS, but only 3% to 5% in the sciences (except for computing, where the figure was 46%). The data were not inflated for spurious citations, because the authors screened the citations to remove those in abstracting services, contents pages and so on. However, the discrepancies may not be as marked following the addition of books to WoS since the publication of Kousha and Thelwall (2009).

WorldCat listings

Libraries obtain books for use in research, education and general reading (White *et al*. 2009), so the WorldCat data documenting uptake of Surrey Beatty & Sons books within Australasia and overseas complement the citation data in assessing use. The holdings indicate that the books have local and, in some cases, a global relevance. While it might be argued that the number of libraries holding books is small in relation to the total number of libraries, libraries have long used interlibrary loans (ILL) to extend availability of their collections nationally and sometimes internationally. In this context, availability of a book on a continent extends its potential reach well beyond the patrons of a single library where demand may have justified purchasing a copy (e.g., Boucher 1997; Levine-Clark 2011). White *et al*. (2009) suggest that library holdings (or 'libcitations' as they call them) should correlate with circulation statistics within libraries, and between libraries by ILL, if

libcitations are a valid measure of usefulness. The libcitations are, of course, far easier to access.

White *et al*. (2009) further argue for the face validity (does the statistic appear to measure what it purports to measure) for libcitations: ' To put it starkly, if you have authored a book of any sort, would you prefer it to be held by 10 Australian libraries or by 100? Would you prefer that its count place it at the middle of a sizeable LC class or at the top? Even without data, would you bet that a book held by many libraries has a better chance of being read than one held by few? Would you object to its being held by any type of library?' We (and probably many others) would answer 'no' to the last question and 'yes' to the others, supporting the face validity of libcitations.

Our finding that more libraries hold journal subscriptions relative to books need not indicate a greater use of journals. The data are biased to an unknown extent by the possibility that some WorldCat entries refer to discontinued subscriptions. Furthermore, journals cater for a broader audience than a single book, so a better indication of relative use is citation counts for book chapters versus journal papers. Finally, library holdings are dynamic, with books being purchased or discarded over the years. It is therefore important to specify a time of searching for WorldCat data exactly as one does for a literature or citation search in a database.

The future of books in an online world

Changes in how people search the literature and the growing interest in evaluating research and researchers are powerful forces in shaping the future of books in scientific publication. While electronic publication and databases may seem to facilitate wide reading, Evans (2008), based on empirical data, found that electronic

publication narrows the range of ideas and information used. Online researchers tend to follow links they find early in their searches rather than reading more widely and making their own judgements about which articles are worthy of citation. This may be exacerbated by links to relevant literature within their journals provided by publishers on their web sites, suggestions of relevant papers based on overlap of citations in databases and rapid electronic exchange of information amongst researchers via Facebook and Twitter. Thus authors often choose references based on visibility or convenience, and it is common for relevant work to be omitted (Lawrence 2007; Wright and Armstrong 2008; Amancio 2012).

There is, though, at least one significant exception. Despite the small contributions of books and book chapters to the overall volume of scientific outputs (Elsevier 2011), Calver *et al*. (2013) found that books and book chapters comprised 20.8%, 17.9% and 19.9% of references in species recovery plans from Australia, New Zealand and the USA respectively. Thus the practitioners who authored these plans clearly searched for, and found, relevant non-journal literature.

The main commercial databases are highly limited in searching for relevant books and book chapters, so authors seriously wishing to search for such material might find more success with GS. While WorldCat can locate books in libraries or indicate global uptake of a particular book, it may not be the quickest route to accessing content. Google Books is a strong alternative, because it covers a wide range of books and supports key word searching. Once a book is found, readers can find libraries in WorldCat, download if the book is open access, or often view substantial portions of content as a preview. Publishers can assist readers by selling individual book chapters as pdfs as well as the complete book, with Digital Object Identifiers (DOIs) to facilitate internet searches.

Overall, books may offer in-depth treatment of specialist topics, or collections of relevant papers on a common theme. As we have shown by examining the library holdings for the publications of Surrey Beatty & Sons, their books do have an uptake beyond Australasia that indicates a measurable global influence. This is complemented by the citation analysis of the books in the *Nature Conservation* series, indicating that researchers do read relevant book chapters and, where appropriate, cite them in their publications. However, the citation analysis also suggested that such uses were declining by 2000. For the influence of books to be restored and continued, publishers need to be more versatile in offering their book content, and readers need to search the book literature deliberately via Google Books or WorldCat as well as the journal literature in other databases. Those concerned with citation analysis need to use GS, Scopus secondary documents or WoSCRS to retrieve representative citations for books and book chapters, or engage with the emerging use of libcitations.

ACKNOWLEDGEMENTS

We thank three reviewers for thoughtful and perceptive comments on an earlier version of this manuscript. However, they do not necessarily share or endorse our opinions.

REFERENCES

Adler, R., Ewing, J. and Taylor, P., 2008. Citation statistics: A report from the International Mathematical Union (IMU) in cooperation with the International Council of Industrial and Applied Mathematics (ICIAM) and the Institute of Mathematical Statistics (IMS).

http://www.mathunion.org/fileadmin/IMU/Report/CitationStatistics.pdf Accessed 28th August, 2012.

Amancio, D. R., Nunes, M. G. V., Oliveira Jr, O. N. and da Costa, L. F., 2012. Using complex networks concepts to assess approaches for citations in scientific papers. *Scientometrics* **91:** 827-842.

Bar-Ilan, J., 2010. Citations to the "Introduction to informetrics" indexed by WOS, Scopus and Google Scholar. *Scientometrics* **82:** 495-506.

Bollen, J., Van de Sompel, H., Hagberg, A. and Chute, R., 2009. A principal component analysis of 39 scientific impact measures. *PLoS ONE* **4:** article number e6022.

Boucher, V., 1997. Interlibrary Loan Practices Handbook. American Library Association, Chicago. 2nd edtion.

Box, S., 2010. Performance-based funding for public research in tertiary education institutions: Country experiences. In OECD Performance-based Funding for Public Research in Tertiary Education Institutions: Workshop Proceedings, OECD Publishing. http://dx.doi.org/10.1787/9789264094611-en

Broadbent, J., 2010. The UK research assessment exercise: performance measurement and resource allocation. *Australian Accounting Review* **20:** 14-23.

Butler, L. and McAllister, I., 2009. Authors' response to reviews. *Political Studies Review* **7:** 84-87.

Calver, M.C., in press. RAM the PI-BETA, C3PO – what the H-STAR happened to my promotion application? Or: The pros and cons of bibliometric evaluations.

Calver, M. C. and Bradley, J. S., 2009. Should we use the mean citations per paper to summarise a journal's impact or to rank journals in the same field? *Scientometrics* **81:** 611-615.

Calver, M.C. and Bradley, J.S., 2010. Patterns of citations in open access and non-open access conservation biology journal papers and book chapters. *Conservation Biology* **24**: 872-880.

Calver, M.C. and King, D.R., 2000. Why publication matters in conservation biology. *Pacific Conservation Biology* **6**: 2-8.

Calver, M. C., Lilith, M. and Dickman, C. R., 2013. A 'perverse incentive' from bibliometrics: could National Research Assessment Exercises (NRAEs) restrict literature availability for nature conservation? *Scientometrics* **95:** 243-255.

Chen, X., 2012. Google Books and WorldCat: A comparison of their content. *Online Information Review* **36:** 507-516.

Coupé, T., 2013. Peer review versus citations - An analysis of best paper prizes. *Research Policy* **42:** 295-301.

Coupé, T., Ginsburgh, V. and Noury, A., 2009. Are leading papers of better quality? Evidence from a natural experiment. *Oxford Economic Papers* **62:** 1-11.

Cooper, S. and Poletti, A., 2011. The new ERA of journal ranking: the consequences of Australia's fraught encounter with 'quality'. *Australian Universities' Review* **53**: 57-65.

Corsi, M., D'Ippoliti, C. and Lucidi, F., 2010. Pluralism at risk? Heterodox economic approaches and the evaluation of economic research in Italy. *American Journal of Economics and Sociology* **69:** 1495-1529.

Craig, J.L., Mitchell, N. and Saunders, D.A. (Eds), 2000. Nature Conservation 5. Conservation in production environments: managing the matrix. Surrey Beatty & Sons, Chipping Norton, NSW, Australia.

Debachere, M-C., 1995. Problems in obtaining grey literature. *IFLA Journal* **21**: 94-98.

Elsevier, 2011. SciVerse Scopus: content coverage guide. Available from http://www.info.sciverse.com/documents/files/scopus-training/resourcelibrary/pdf/sccg0510.pdf. Accessed February 10, 2013.

Evans, J. A., 2008. Electronic publication and the narrowing of science and scholarship. *Science* **321**: 395-399.

Gihus, N.E. and Sivertsen, G., 2009. Publishing affects funding in neurology. *European Journal of Neurology* **17**: 147-151.

González-Pereira, B., Guerrero-Bote, V. P. and Moya-Anegón, F., 2010. A new approach to the metric of journals scientific prestige: The SJR indicator. *Journal of Informetrics* **4:** 379-391.

Harzing, A. W. K. and van der Wal, R. 2008. Google Scholar as a new source for citation analysis. *Ethics in Science and Environmental Politics* **8:** 61-73.

Jacsó, P., 2008a. Testing the calculation of a realistic h-index in Google Scholar, Scopus, and Web of Science for F. W. Lancaster. *Library Trends* **56:** 784-815.

Jacsó, P., 2008b. Google Scholar's ghost authors. *Library Journal* **134:** 26-27.

Kousha, K. and Thelwall, M., 2009. Google book search: Citation analysis for social science and the humanities. *Journal of the American Society for Information Science and Technology* **60:** 1537-1549.

Kousha, K., Thelwall, M. and Rezaie, S., 2010. Using the web for research evaluation: the Integrated Online Impact indicator. *Journal of Informetrics* **4:** 124-135.

Kousha, K., Thelwall, M. and Rezaie, S., 2011. Assessing the citation impact of books: The role of Google Books, Google Scholar, and Scopus. *Journal of the American Society for Information Science and Technology* **62:** 2147-2164.

Lawrence, P. A., 2007. The mismeasurement of science. *Current Biology* **17:** (15).

Levine-Clark, M., 2011. Whither ILL? Wither ILL: the changing nature of resource sharing for E-books. *Collaborative Librarianship* 3: 71-72.

Lortie, C. J., Aarssen, L. W., Budden, A. E. and Leimu, R., 2013. Do citations and impact factors relate to the real numbers in publications? A case study of citation rates, impact, and effect sizes in ecology and evolutionary biology. *Scientometrics* **94:** 675-682.

Metz, E. J., 2013. New venues for discovering fire and emergency services literature. *Fire Technology* **49:** 185-194.

OCLC, 2012. 25 reasons to choose WorldCat. Available from http://www.oclc.org/worldcat/25reasons/default.htm Accessed February 10th, 2013.

OECD, 2010. Performance-based Funding for Public Research in Tertiary Education Institutions: Workshop Proceedings, OECD Publishing. http://dx.doi.org/10.1787/9789264094611-en

Oswald, A.J., 2010. A suggested method for the measurement of world-leading research (illustrated with data on economics). *Scientometrics* **84:** 99-113.

Saunders, D.A. and Hobbs, R.J., (Eds), 1991. Nature Conservation 2. The role of corridors. Surrey Beatty & Sons, Chipping Norton, NSW, Australia.

Saunders, D.A., Arnold, G. W., Burbidge, A. A. and Hopkins, A. J. M., (Eds), 1987. The role of remnants of native vegetation. Surrey Beatty & Sons, Chipping Norton, NSW, Australia.

Saunders, D.A., Hobbs, R.J. and Ehrlich, P.R., (Eds), 1993. Nature Conservation 3. Reconstruction of fragmented ecosystems: global and regional perspectives. Surrey Beatty & Sons, Chipping Norton, NSW, Australia.

Saunders, D.A., Craig, J.L. and Mattiske, E.M. (Eds), 1996. Nature Conservation 4. The role of networks. Surrey Beatty & Sons, Chipping Norton, NSW, Australia.

SCImago, 2007. SJR — SCImago Journal & Country Rank. Consejo Superior de Investigaciones Científicas (CSIC), University of Granada, Extremadura, Carlos III (Madrid) & Alcalá de Henares, Spain. Available from http://www.scimagojr.com. Accessed December, 2012.

Smith, J. A. and Nelson, M. L., 2008. Site design impact on robots: An examination of search engine crawler behavior at deep and wide websites. *D-Lib Magazine* **14:** (3-4).

Stergiou, K.I.S. and Tsikliras, A.C., 2006. Underrepresentation of regional ecological research output by bibliometric indices. *Ethics in Science and Environmental Politics* **6:** 15-17.

Testa, J., 2006. The Thomson Scientific journal selection process. *International Microbiology* **9:** 135-138.

Testa, J., 2012. The book selection process for the *Book Citation Index* in *Web of Science*. Available from http://wokinfo.com/media/pdf/BKCI-SelectionEssay_web.pdf Accessed February 10th, 2013.

Thomson Reuters, 2011. Completing the research picture. Book Citation Index in Web of Science. Available from http://wokinfo.com/media/pdf/bkci_fs_en.pdf Accessed January 13th, 2013.

Torres-Salinas, D. and Moed, H. F., 2009. Library Catalog Analysis as a tool in studies of social sciences and humanities: An exploratory study of published book titles in Economics. *Journal of Informetrics* **3:** 9-26.

Visser, G., 2009. Tourism geographies and the South African National Research Foundation's Researcher Rating System: international connections and local disjunctures. *Tourism Geographies* **11**: 43-72.

von Ende, C. N., 2001. Repeated measures analysis: growth and other time-dependent measures. Pp. 134-157 *in* Design and analysis of ecological experiments ed by S. M. Scheiner and J. Gurevitch. Oxford University Press, New York. 2nd edition.

Walters, W. H., 2011. Comparative recall and precision of simple and expert searches in Google Scholar and eight other databases. *Portal* **11:** 972-1006.

White, H. D., Boell, S. K., Yu, H., Davis, M., Wilson, C. S. and Cole, F. T. H., 2009. Libcitations: A measure for comparative assessment of book publications in the humanities and social sciences. *Journal of the American Society for Information Science and Technology* **60:** 1083-1096.

Wright, M. and Armstrong, J. S., 2008. The ombudsman: Verification of citations: Fawlty towers of knowledge? *Interfaces* **38:** 125-139.

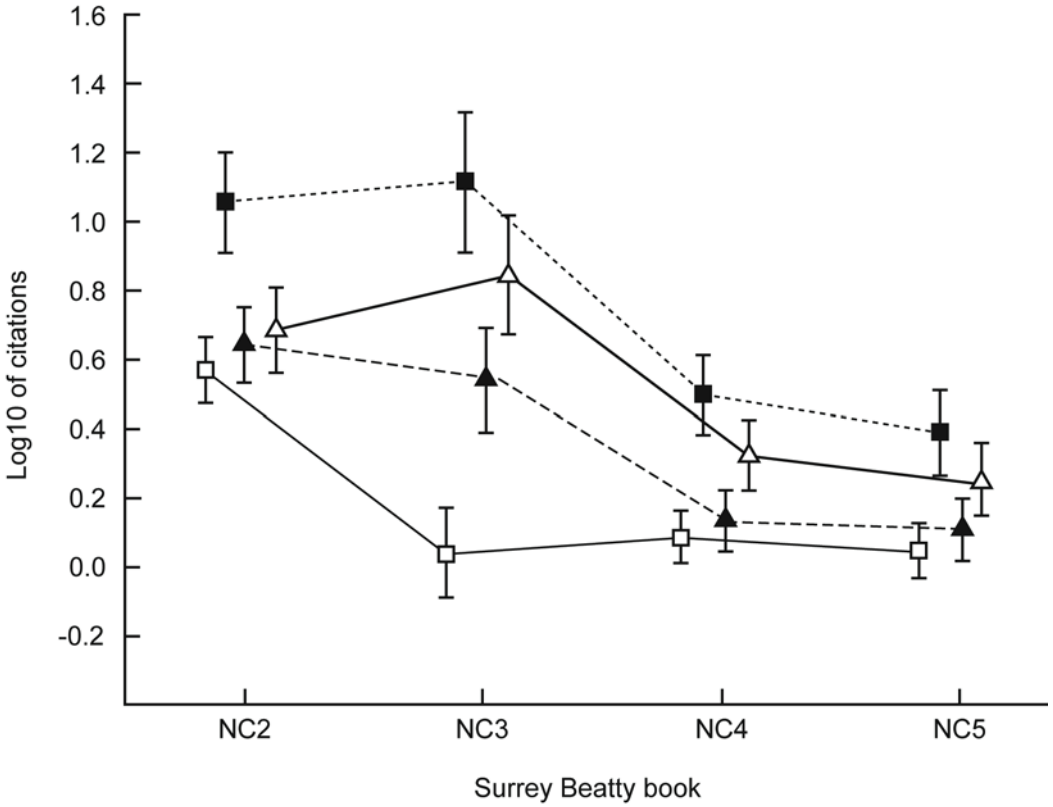


Figure 1. Interaction plot of a significant interaction in repeated measures ANOVA between Book (the last four books in the Surrey Beatty & Sons Nature Conservation Series – NC2 Saunders and Hobbs 1991; NC3 Saunders *et al*. 1993; NC4 Saunders *et al*. 1996; NC5 Craig *et al*. 2000) and Database (the mean citations for the chapters in each book from Web of Knowledge (open squares), Scopus (open triangle), Web of Science Cited Reference Search (filled triangle), and Google Scholar (filled square). The mean number of citations is shown on the vertical axis (note the $\log_{10}$ scale). Error bars indicate 95% confidence intervals.

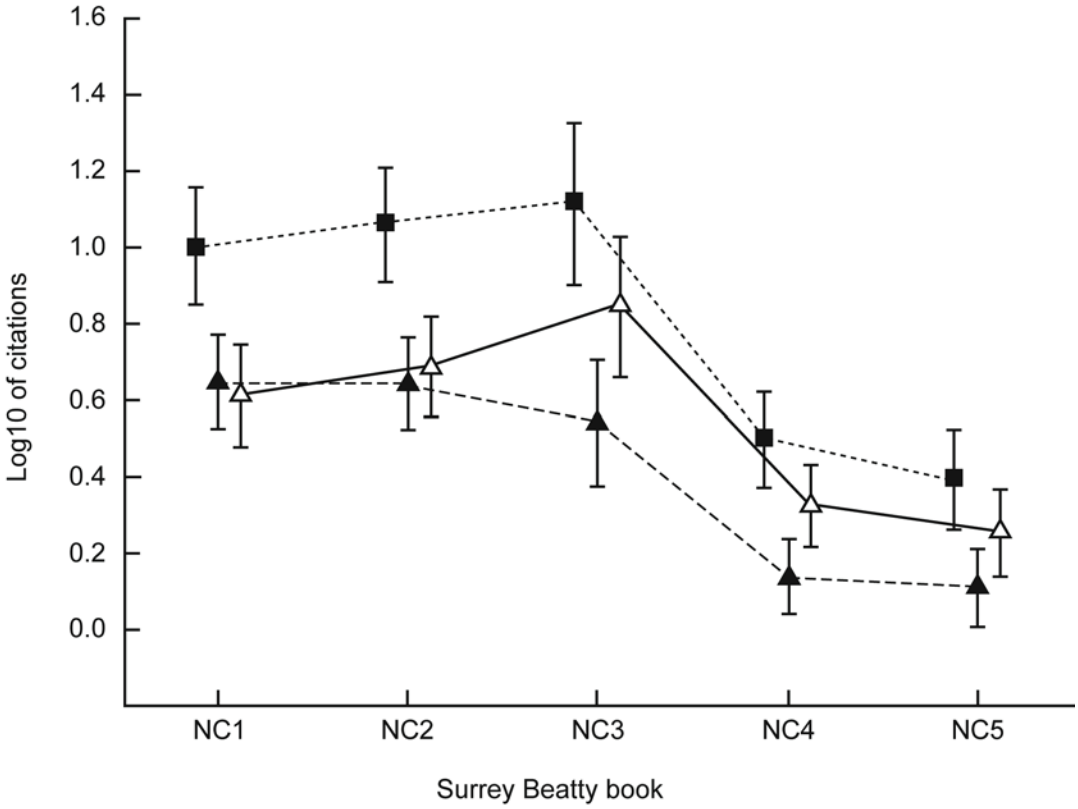


Figure 2. Interaction plot of a significant interaction in repeated measures ANOVA between Book (the five books in the Surrey Beatty & Sons Nature Conservation Series – NC1* Saunders *et al*. 1987; NC2 Saunders and Hobbs 1991; NC3 Saunders *et al*. 1993; NC4 Saunders *et al*. 1996; NC5 Craig *et al*. 2000) and Database (the mean citations for the chapters in each book from Scopus (open triangle), Web of Science Cited Reference Search (filled triangle), and Google Scholar (filled square). The mean number of citations is shown on the vertical axis (note the $\log_{10}$ scale). Error bars indicate 95% confidence intervals.
* The first book in the series was never actually designated with a series name, but we have used it as a notation of convenience.

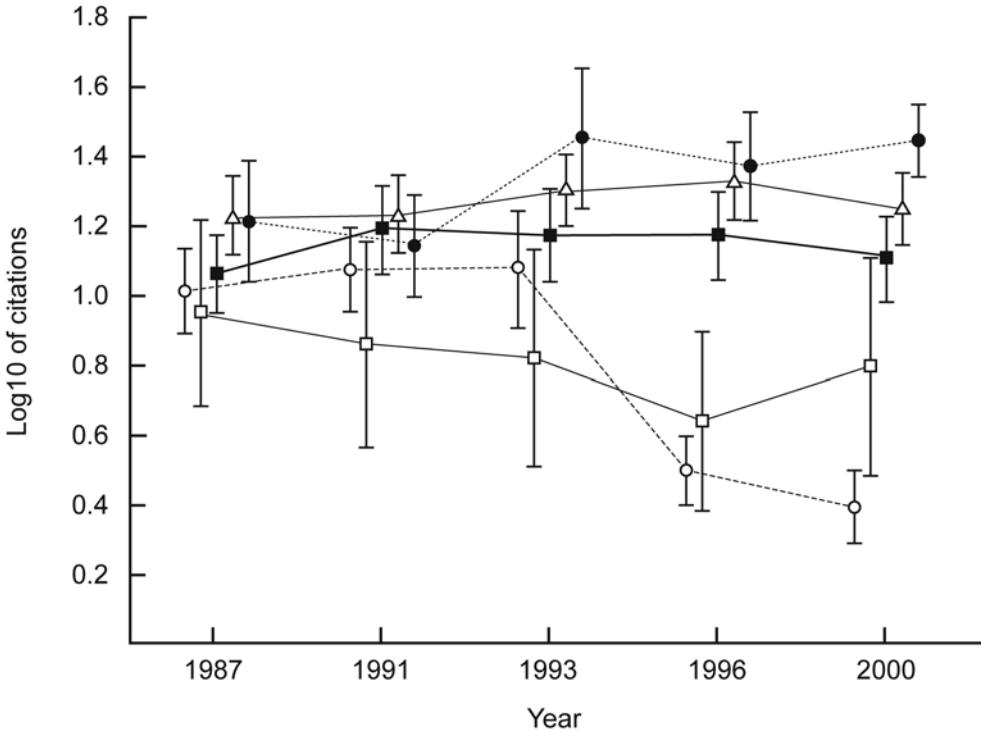


Figure 3. Interaction plot of a significant interaction in a two-way ANOVA between Year (the five years in which the five books in the Surrey Beatty & Sons Nature Conservation Series were published) and Publications (the mean Google Scholar citations for the chapters in each book and for the papers from four Australian journals in the same years). The mean number of citations is shown on the vertical axis. Note the $\log_{10}$ scale on the vertical axis. Open circle: Surrey Beatty books. Open square: *Australian Zoologist*. Solid square: *Australian Journal of Zoology*. Triangle: *Wildlife Research*. Closed circle: *Austral Ecology*. Error bars indicate 95% confidence intervals.

Table 1. The mean number of libraries from eight countries holding Surrey Beatty & Sons natural history books published between 1990 and 2010.

Country	Mean libraries	Standard Error	Median libraries	Minimum libraries	Maximum libraries
Australia	45.3	2.2	47.0	6	102
USA	36.1	14.1	15.5	0	1077
UK	2.4	0.2	2.0	0	11
NZ	3.2	0.4	2.0	0	21
Canada	2.4	0.6	1.0	0	40
Hong Kong	0.4	0.1	0.0	0	2
Germany	1.6	0.2	1.0	0	6
South Africa	0.7	0.2	0.0	0	8

Table 2. The mean number of libraries from eight countries holding Royal Zoological Society of NSW books published between 1990 and 2010.

Country	Mean libraries	Standard Error	Median libraries	Minimum libraries	Maximum libraries
Australia	44.4	4.2	44.0	2	83
USA	20.6	2.5	20.0	0	52
UK	3.0	0.3	3.0	0	8
NZ	2.8	0.5	3.0	0	7
Canada	0.2	0.1	0.0	0	2
Hong Kong	0.2	0.1	0.0	0	2
Germany	2.2	0.3	2.5	0	5
South Africa	1.2	0.3	1.0	0	5

Table 3. The total number of libraries from eight countries holding hard copy subscriptions to five Australian journals in the general areas of ecology/conservation/wildlife biology. Note that the figures include both current and discontinued subscriptions.

Country	*Pacific Conservation Biology*	*Australian Journal of Zoology*	*Australian Zoologist*[1]	*Austral Ecology*	*Wildlife Research*
Australia	41	75	100	59	78
USA	45	181	242	538	79
UK	1	14	6	15	6
NZ	4	15	15	12	8
Canada	2	23	17	36	11
Germany	0	12	0	0	5
Hong Kong	0	1	0	2	1
South Africa	6	23	6	13	10

1 It is difficult from the WorldCat listings to disambiguate whether some supposed holding of *Australian Zoologist* are in fact holdings of any publication of the Royal Zoological Society of New South Wales.

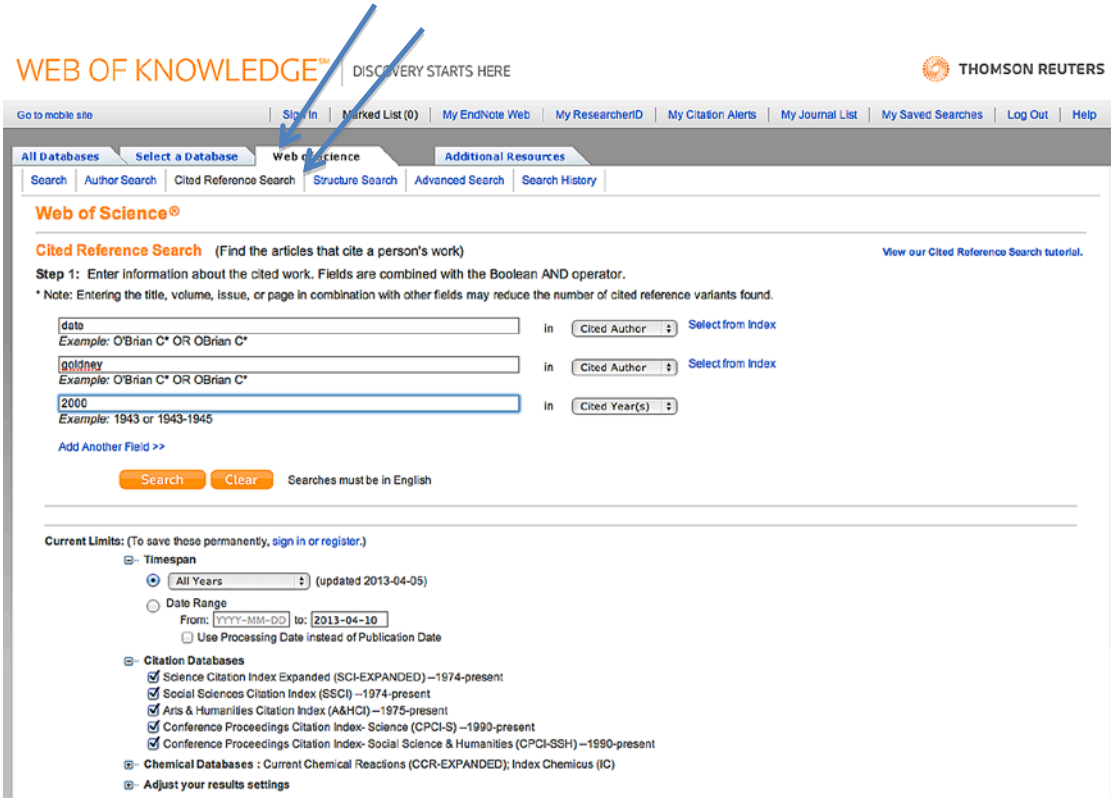
Table 4. The sources of the citations identified in Google Scholar for a randomly chosen chapter (with at least 10 citations) from each book in the Surrey Beatty & Sons Nature Conservation series.

Citing source	SCImago rating	Saunders *et al.* (1987)	Nature Conservation 2 (Saunders and Hobbs 1991)	Nature Conservation 3 (Saunders *et al*. 1993)	Nature Conservation 4 Saunders *et al*. (1996)	Nature Conservation 5 (Craig *et al*. 2000)
Agriculture, Ecosystems and Environment	1		1		1	
American Naturalist	1		1			
Amytornis	4*			1		
Austral Ecology	1			1		
Australian Geographical Studies	4*				1	
Australian Journal of Botany	2	1				
Australian Journal of Entomology	2					1
Australian Zoologist	4					1
Biodiversity and Conservation	1			1		1
Biological Conservation	1	2	2	1	3	1
Brazilian Journal of Biology	2			1		
Canberra Bird Notes	4*				1	
Conservation Biology	1	1	5	1		
Crop and Pasture Science	1.5				1	
Cunninghamia	4*	1				
Ecography	1		1			
Ecological Applications	1		1			
Ecological Management and Restoration	2.5			1		
Ecology	1		1			
Ecology and Society	1				1	
Forest Ecology and Management	1					1

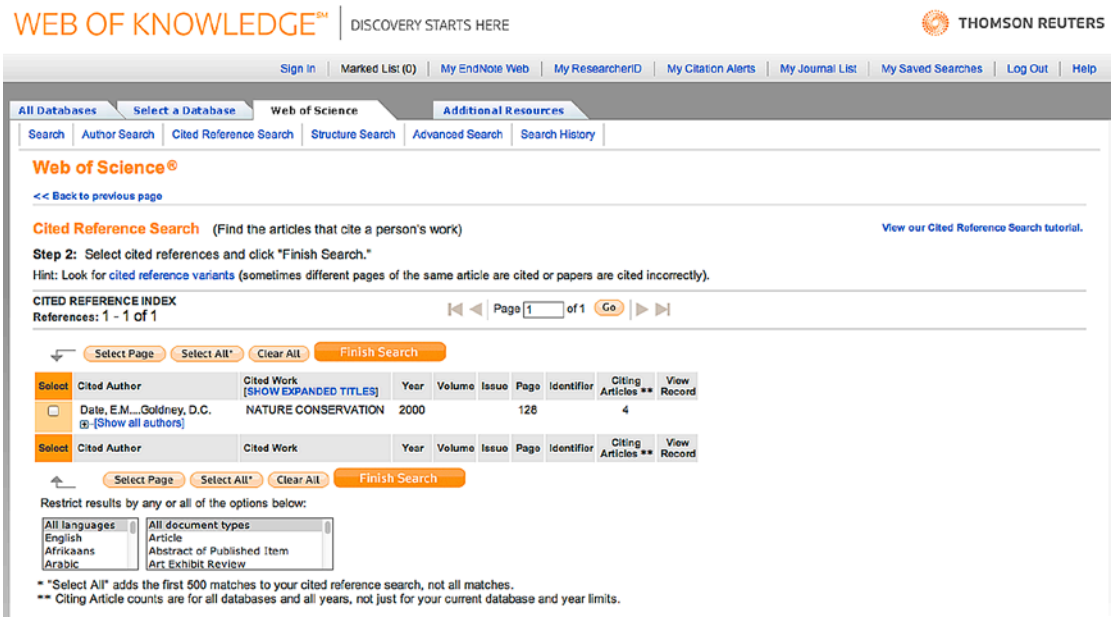
International Journal of Ecology and Environmental Sciences	4			1		
Journal of Insect Conservation	1					4
Journal of the Royal Society of New Zealand	1	1				
Journal of Zoology (London)	1				1	
Landscape and Urban Planning	1			1	1	
Landscape Ecology	1	1	2		1	
Oecologia	1	1	1			
Oikos	1		1			
Pacific Conservation Biology	3	2	1	4	2	1
Plant and Soil	1		1			
Tasforests	2					2
Tropical Ecology	2			1		
Wildlife Biology	2		1			
Wildlife Research	1.5	1	3		1	
Book or book chapter	-	7	8	1		
Report	-	9	2	2	2	4
PhD thesis	-		2	1	1	
Conference proceedings	-			6		
Total 1 and 1.5		7	20	5	10	7
Total 2 and 2.5		1	1	3	0	3
Total 3 and 3.5		2	1	4	2	1
Total 4 and 4*		1	0	2	2	1
Total other		16	12	10	3	4
Total	-	27	34	24	17	16

Appendix 1. Procedures for performing a Cited Reference Search in Web of Science. This example searches for the book chapter Date, E.M., Goldney, D.C., Bauer, J.J. and Paull, D.C., 2000. The status of threatened fauna in New South Wales Cypress Woodlands: implications for State Forest Management. Pp. 128-145 in Nature Conservation 5 - Conservation in Production Environments: Managing the Matrix. ed by J.L. Craig, N. Mitchell and D.A. Saunders. Surrey Beatty & Sons, Chipping Norton, NSW, Australia.

Step 1. In the Web of Science database, select the Cited Reference Search option. Enter one or more authors' names in the search boxes. Note that it is also possible to search by title, but this can be riskier because citing authors may miscite the title. Then set the year to the year of publication, to reduce the potential large number of results that could come if the search is set to all years. If you wish, set a range of years to bracket the real year of publication (e.g., 1999 - 2001) in case there is a stray citation which has the year of publication wrong.

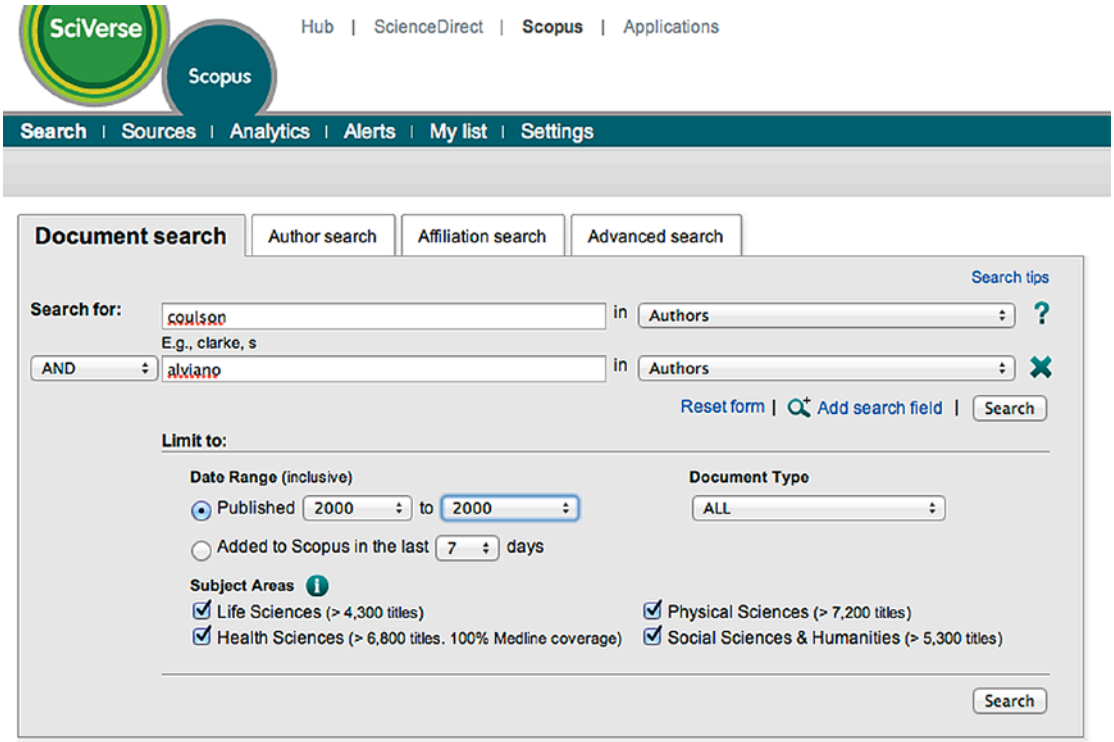


Step 2. Click 'Search' to progress to the results screen. In this case, there is only one result that gives the chapter desired. It has four citations. In some cases, citing authors may have varied in details such as pagination that lead to multiple entries for one chapter. These need to be identified in the output and the citation count aggregated.

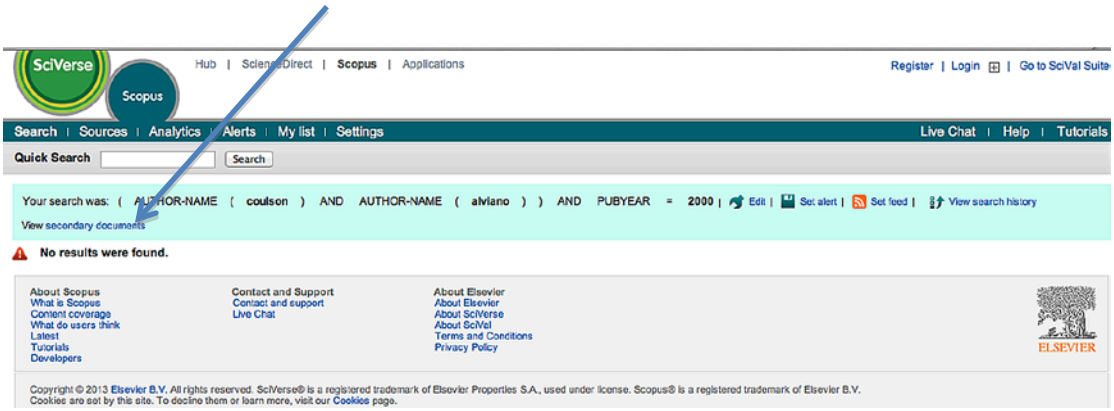


Appendix 2. Procedures for using the 'secondary documents' link in Scopus. This example searches for the book chapter Coulson, G., Alviano, P., Ramp, D., Way, S., McLean, N. and Yazgin, V., 2000. The kangaroos of Yan Yean: issues for a forested water catchment in a semi-rural matrix. Pp. 146-156 in Nature Conservation 5 - Conservation in Production Environments: Managing the Matrix. ed by J.L. Craig, N. Mitchell and D.A. Saunders. Surrey Beatty & Sons, Chipping Norton, NSW, Australia.

Step 1. In the Scopus database, enter one or more authors' names in the search boxes. Note that it is also possible to search by title, but this can be riskier because citing authors may miscite the title. Then set the year to the year of publication, to reduce the potential large number of results that could come if the search is set to all years. If you wish, set a range of years to bracket the real year of publication (e.g., 1999 - 2001) in case there is a stray citation which has the year of publication wrong.



Step 2. Click 'Search' to progress to the results screen. No results are displayed because this chapter is not listed in Scopus. However, any citations from Scopus listed sources to the chapter can be identified by clicking the 'secondary documents' link immediately above 'No results were found.'



Step 3. The next screen shows two entries for the chapter, one with one citation and the other with seven. Two entries are given because the top entry inserts the digit '1' immediately after the book title and hence is not identical with the second entry. Summing the two citation counts gives a final value of 8.